

TITLE

DEBATING THE PRINCIPLES:
ABC AND ITS DOMINANT PRINCIPLE OF WORK

PRESENTED BY

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INTRODUCTION

This article is the third in the *Debating the Principles* series in *Cost Management*, which takes a critical look at the principles that underlie existing management accounting (MA) approaches. The focus in this series is on foundational principles for effective decision support. Decision science falls in that branch of the scientific method that deals with inferences of causes and their effects in different time frames (i.e., origin/historical science). The scientific method (whether operations science or origin science) has as its foundation inductive logic and causality as the guiding principle.¹ In business, decisions are concerned with understanding cause and effect outcomes in the future. For managers, MA is the primary source of causal insights and their corresponding monetary implications.² Against that background, this series has a twofold purpose: 1) point to limitations of principles across a spectrum of MA approaches that compromise their decision support capabilities, and 2) highlight problems and inconsistencies in various MA approaches that fundamentally rely on inappropriate principles.

The first article in this series looked at the *theory of constraints* and its narrow view of relevance to support enterprise optimization. In the second article, *lean accounting* and its production design principle (the flow-path) was discussed. This third article looks at *activity-based costing* (ABC) practices and their guiding principles. ABC came to prominence in the 1980s on the realization that relevance in MA was lost.³ ABC emphasizes an activity view of resource outputs. In common practice, expenses (i.e., resources in ABC vernacular) are mapped to activities. Activity drivers, in

turn, serve to assign activity costs to final consumers such as products and customers.

Activity thinking has a long history in MA. The first formal definitions for an activity and activity accounting appeared in 1952.⁴ General Electric in the early 1960s used activity analysis to understand their indirect costs.⁵ Staubus, borrowing from Kohler, attempted to establish a formal activity accounting system with guidelines on principles and practices.⁶ Activity thinking also found practical application throughout the 1970s and early 1980s.⁷

Nevertheless, Johnson and Kaplan's *Relevance Lost* was a tipping point in that it highlighted the compelling need for change. In parallel, CAM-I developed a conceptual model using what they called activity-based cost.⁸ Initial ABC models were simplistic and lacked robust information technology support. Nonetheless, a lack of good decision support information for managers and aggressive marketing of the concept resulted in a bandwagon effect that took ABC too far too quickly. This is underscored by the fact that throughout the 1990s and into the new millennium ABC saw a number of refinements such as activity-based management (ABM), activity-based budgeting (ABB), and activity-based planning (ABP) added to its capabilities.

Two decades after ABC came to prominence, research reveals surprisingly low levels of sustained adoption for the approach.⁹ Proponents admit to challenges in the marketplace and a new version (time-driven ABC) is said to address the initial shortcomings.¹⁰ However, is the root cause of ABC's inability to restore relevance understood? After discussing the principles adopted for traditional ABC and their consequences, this



article contends that the lack of a coherent set of guiding principles from the outset led to ABC failing to meet expectations. The article concludes by looking at time-driven ABC as the proposed solution that must address traditional ABC's fundamental weaknesses.¹¹

THE PRINCIPLES EARLY ON

Three principles in ABC will be discussed, namely causality, variability, and work.¹² Readers that followed the MA philosophy series and this current series will be familiar with the first two principles. The third is noteworthy for the prominent position it enjoys in ABC and the inappropriate dominance it wields over the other two principles.

TRADITIONAL ABC AND THE PRINCIPLE OF CAUSALITY

Staubus viewed causality as crucial in assigning activity inputs and outputs. He suggested that non-causal costs (e.g., idle capacity costs) be excluded from activities altogether.¹³ Note Staubus' point here: the allocation of the cost of *inactivity* to an activity is paradoxical and anything but an appropriate approach to activity-based costing. He also recognized that causality is quantity-based, i.e., causal relationship modeling in costing should occur between operational input and output quantities. Staubus therefore proposed the use of input and output quantities in activity modeling and their valuation with standard rates.¹⁴

In ABC literature from the late 1980s, such clear insight into the principle of causality is lacking. Although cause and effect relations are mentioned, the focus is primarily on: 1) tracing general ledger dollars to activities, and 2) assigning activity drivers to final consumers, e.g., products and customers. Full absorption costing and assigning the paradoxical

excess/idle activity to products was widely practiced in traditional ABC. These practices undermined an accurate reflection of the principle of causality in traditional ABC cost modeling.

In particular, the tracing of general ledger expense accounts directly to activities resulted in a gaping hole in ABC information. There was no view that provided insight into the costs of an organization's physical resources. ABC equated general ledger expense accounts to resources. However, an organization's physical resources are the focal point of any manager's decision analysis. Not all practitioners fell into this trap, and one does find ABC models recognizing the need for what is called resource drivers for mapping resource costs to activities. Nevertheless, the primary purpose of these resource drivers was still to map expenses to activities. An explicit resource-related cost object such as the German *Leistungsart* (resource pool) in GPK did not exist in early ABC models.

Moreover, the allocation of the costs of support activities directly to primary activities further weakened causal insights. For example, allocating the costs of a support activity (process payroll) directly to a primary activity (the production activity run machine) bypasses the actual causal consumer—the resource on the production line that was paid. Bypassing the resource in this manner (a natural consequence of not having a resource-related cost object in the first place) compromised causal insights in two crucial areas. First, since resources have capacity, incomplete resource costs resulted in incorrect capacity cost information. This heightened the potential for erroneous capacity-related decisions using ABC information. Second, incomplete resource costs also impeded a decision maker's ability



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to arrive at all of a resource's potentially relevant costs in decision analysis. This second shortfall was particularly critical since every decision managers make is a resource application decision. For example, even the practice of outsourcing a process—for which ABC information often served as the justification—is in the final analysis a resource application decision. That is, a process outsourced without a corresponding reduction in resources does not result in avoiding any costs—the resources will merely be idle. Consequently, lacking avoidable and unavoidable cost insights for resource and process outsourcing decisions opened the door to the input-side fixed cost death spiral—to which ABC fell prey.¹⁵

Many problems resulted from these compromises on causality, including the effort and cost of a traditional ABC model's design and upkeep. In particular, failing to recognize that causality is quantity-based resulted in inflexible percentage-based models. Updating the model meant re-conducting interviews and updating affected expense-to-activity mappings. Full absorption costing and the lack of resource cost insights contributed to decision errors and ultimately to questioning ABC's credibility as a decision support tool. Essentially, this was all the result of undisciplined practices regarding ABC that violated the principle of causality—MA's first and most fundamental principle.

TRADITIONAL ABC AND THE PRINCIPLE OF VARIABILITY

This discussion follows traditional conventions for the concepts variability and avoidability, i.e., fixed and variable are short-term operational concepts, and avoidable and unavoidable are concepts used in decision analysis. ABC literature can be confusing on the topics of variability and avoidability. MA traditionally

defines variability in relation to volume/output. Avoidability on the other hand refers to whether a cost can be eliminated due to a decision. These concepts were clearly differentiated as far back as the early 1920s.¹⁶ It is vital to distinguish them for the proper use of operational cost information in decision analysis. Variable and avoidable are therefore not synonymous, and neither are the terms fixed and unavoidable.

ABC practitioners nevertheless often use the terms fixed and variable dichotomously in reference to operational cost behavior (i.e., variability) and at other times in reference to decision cost behavior (i.e., avoidability). For example, *"That's the definition of a fixed cost, one that stays constant even as sales volume increases or decreases."*¹⁷ Contrast this correct use of the fixed cost concept with the following: *"A company pays for these committed resources, whether or not they are used during the period. That is why many economists and accountants refer to them as fixed costs. While this name is, in a narrow sense, technically correct, it is also misleading; the term fixed costs has confused generations of managers and accountants. The costs are fixed only because managers do not act to change them."*¹⁸

Does this mean that costs that change due to managerial actions are avoidable costs? Readers versed in the traditional use of the concepts must apply circumspection when considering many ABC claims. It is unclear to what extent such inconsistent use of terminology contributed to ABC's decision support challenges. It is worth noting that the practice of blending operational and decision cost concepts (the blended cost concept error) is not unique to ABC.¹⁹ As was pointed out in the first and second articles in this series, both the

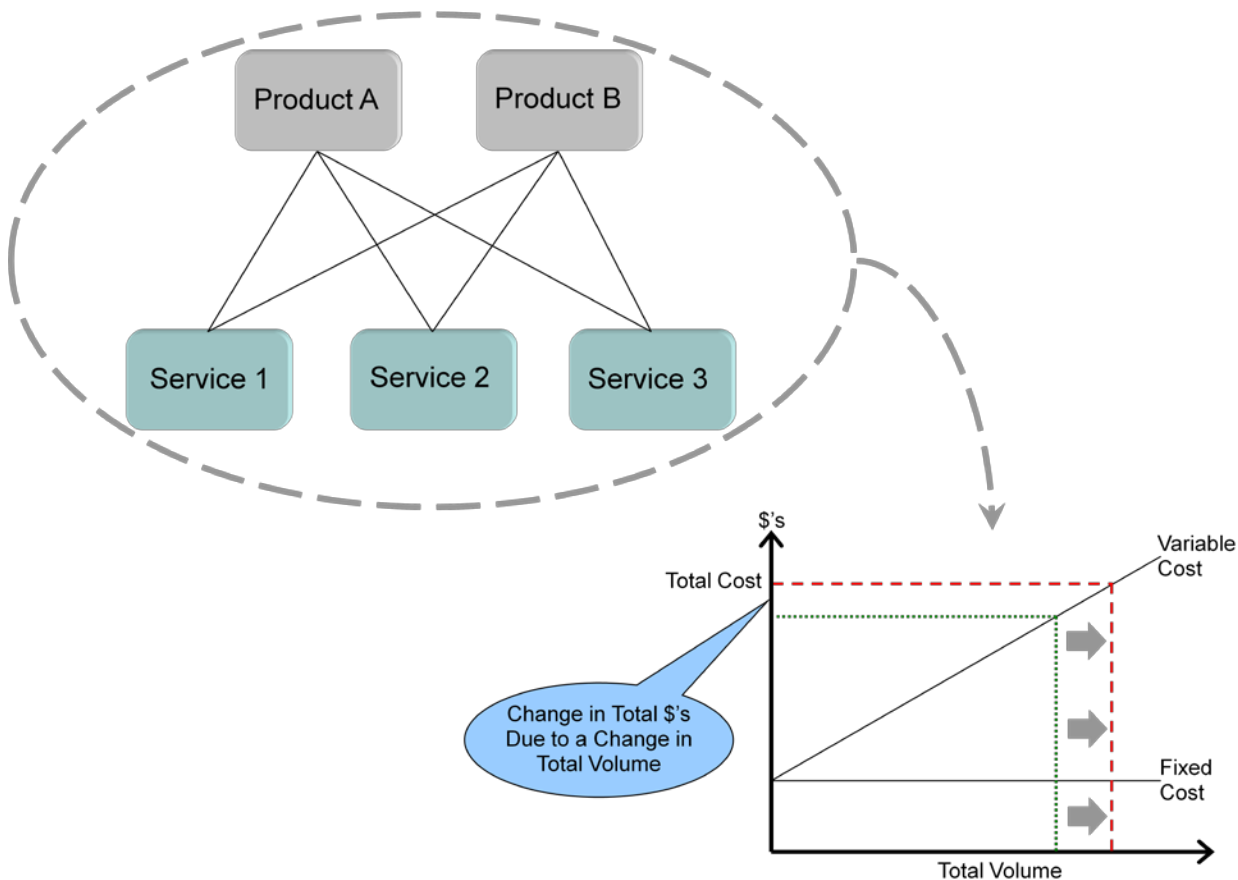


theory of constraints (TOC) and lean accounting also commit this error. TOC's "totally variable cost" concept is the earliest example of this error. The blended cost concept error did not originate with ABC but it is nevertheless pervasive in ABC literature and practice. Even so, ABC's terminology issues cannot be viewed in isolation, but must be viewed as a result of the misapplication of principles, particularly with regard to cost behavior.

Johnson and Kaplan correctly identified the principle of variability as problematic (i.e., not all costs

behave in relation to total volume as variability assumes—see *Exhibit 1*).²⁰ They nevertheless incorporated variability into their view of cost behavior for ABC but suggested adding time (the long term) to determine whether a product cost is "fixed"²¹ or "variable."²² Their "all is variable" view quickly became accepted ABC practice. Thus, ABC separated cost behavior from individual causal relationships and tied it to time (the long term).

EXHIBIT 1: THE PRINCIPLE OF VARIABILITY – TOTAL VOLUME VS. TOTAL COST





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The addition of a time dimension in cost behavior for ABC meant a switch to the economist's view of avoidability (i.e., variability over time) away from variability as properly defined in management accounting.²³ As Johnson and Kaplan admit, the impact that decisions have on cost comes into play with the time dimension.²⁴ However, who is to say which decisions will be adopted over their "reasonable time period" and which costs would change because of those decisions?²⁵ No single answer to this question exists. As Shillinglaw had pointed out twenty-four years before *Relevance Lost*, such a long-run cost concept is simply unknowable: *"The main difficulty in applying this concept is that it presumes a simple world that is long since gone, in which the organization is monolithic, the output unvalued, and the product follows a unique path through the facilities devoted solely to that product."*²⁶

In reality, to estimate long-run variable costs ABC would have to guess the net effect of multiple products of varying mix passing through multi-purpose facilities to markets that are in flux and that are comprised of fickle customers. Moreover, ABC must also factor in management decisions that further impact product volumes, mix, resources, efficiency, and technology. Long-run variable cost is simply unattainable as a basis for cost modeling and decision support.

ABC's emphasis on the long-term view it adopts for cost behavior does not pass muster if MA must provide causal insights. ABC stakes an important aspect of cost modeling (i.e., cost behavior) on the time dimension. Proponents reason that time (the long-term) ultimately determines whether a cost will become "variable" (i.e., avoidable). Is time really a causal factor

that can serve as the basis for modeling decision support information?

On the contrary, the long-term outcome is comprised of many short-term decisions. ABC admits to many decisions over the long term that collectively change costs considered operationally fixed. The long-term is therefore like a wall and all the incremental decisions taken over time are the bricks in the wall. There is no wall without the bricks; there are no long-term "variable" costs without individual incremental decisions. Clearly, the individual incremental decisions cause costs to change—not time. A single decision (taken in seconds) that makes an entire company's costs "variable" (i.e., the decision to go out of business) illustrates that time is merely a condition—not a cause. In the scientific method confusing a condition for a cause is a known fallacy.²⁷ The decision makers' need for oxygen is similarly a concomitant condition—without oxygen there will be no incremental decisions and no long term cost changes. However, neither the long term nor oxygen is a causal factor for cost behavior in decision-making—they are frankly both irrelevant to MA's cost model.²⁸ ABC commits the fallacy of confusing a cause and a condition with its emphasis on the long term. Nevertheless, the default cost behavior view adopted for ABC modeling was to reflect long-run avoidable costs as variable costs on its activities. The blended cost concept error was therefore embedded in the approach from the beginning.²⁹ The result was that ABC went to market reflecting relevant costs for no particular decision for a vague timeframe. In hindsight, failure on the decision support front was a *fait accompli* from the outset.

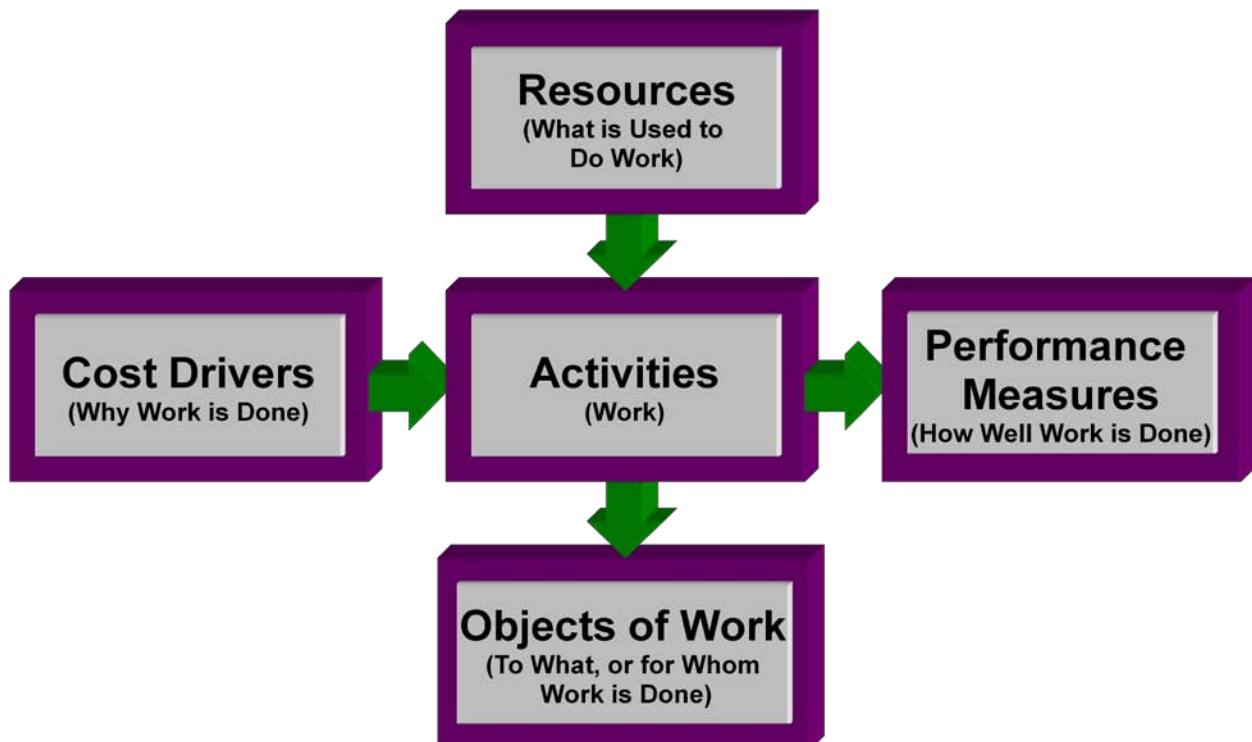


Companies using ABC information predictably ran into the fixed cost death spiral; activity costs were not avoidable, at least not for the decision timeframes for which the information was used.³⁰ ABC's view of time as a causal factor in cost behavior led to three fundamental errors: 1) divorcing cost behavior from causality, 2) an impractical long-term decision-based cost concept, and 3) committing the blended cost concept error. Moreover, claims of budgeting and what-if capabilities were suspect because ABC had no mechanism to determine which short-term costs (the variable costs) to increment or decrement and which costs (the fixed costs) to leave unchanged.

TRADITIONAL ABC AND THE PRINCIPLE OF WORK

This principle is expressed in various ways, in *Relevance Lost* as ". . . the activity measures that cause cost variation to occur,"³¹ by CAM-I as ". . . costs are incurred through a firm's activities,"³² and by some authors as the primary principle in ABC.³³ Thus, the work principle wields broad influence as the determinant of cost variation, cost incurrence, and causal relationships. The ABC cross (see *Exhibit 2*) aptly demonstrates the central position that the work principle enjoys in ABC.³⁴

EXHIBIT 2: ACTIVITIES (WORK) AS THE CRUX OF ABC





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The work principle, for all its persuasive simplicity, had one drawback: it is so poorly defined that it ended up undermining the two other (already compromised) principles. Causality was further eroded by the work principle justifying activity-to-activity allocations, and cost behavior insights were weakened by implying a link between activities and cost causation. This latter view added to the confusion around variability and avoidability and exacerbated errors in decision-making when using ABC information. For example, since all the costs on an activity/business process were considered "variable", the reasoning was that these costs would no longer be incurred when the activity/process is outsourced. In practice this turned out not to be the case because cost avoidability is a function of reducing the resources and not merely their work.

The primary weakness in ABC's guiding principles was the failure to recognize cost behavior (i.e., variability) as the flipside of the causality coin.³⁵ Once variability was divorced from causality by defining it to align with relevance over the long term, there was nothing to guide the interpretation of ABC information in decision analysis. The principle of work stepped into this void by claiming a link to cost causation—to devastating effect. Thus, a perfect storm was set in motion, first, by abandoning established practices in MA for the application of the principles of variability and avoidability with the long-term view of cost behavior that was adopted; second, with rigid, complex cost models that were costly to maintain and that were comprised of compromised causal relations.

Arguably, the most telling deficiency in ABC information that flows from the way principles were used is the lack of resource-related insights. In particular,

insight into resources and their divisibility was totally lacking.³⁶ The traditional view is that in decision analysis the divisibility of resources ultimately determines avoidability.³⁷ Surprisingly, ABC proponents recognize this fact.³⁸ Nevertheless, the lofty position afforded the work principle means that traditional ABC is incapable of providing managers with information on this crucial aspect of decision analysis.

TIME-DRIVEN ABC: A SECOND BITE AT THE CHERRY

The introduction of time-driven ABC (TD-ABC) attempts to salvage what is truly innovative and beneficial in activity-based thinking. How does TD-ABC address the fundamental errors committed by ABC thinking of the 80s and 90s with regard to causality, variability, and the work principle?

TD-ABC AND THE PRINCIPLE OF CAUSALITY

The biggest advances in TD-ABC occurred around the principle of causality. Percentage-based assignment of resources (costs) to activities is now discouraged.³⁹ Departmental resource cost rates serve to value resource output quantities and address many of the issues with the level of effort, cost, and sustainability of traditional ABC models. This resource emphasis also curbs some of the issues related to full absorption costing and spreading of common fixed costs arbitrarily through the model.

Regarding causal insights for decision support, TD-ABC makes encouraging improvements. Activity-to-activity allocations that previously compromised on causality have all but disappeared. The first objective in TD-ABC is now "fully loaded department costs."⁴⁰ "Fully loaded cost" is not defined, but one can assume that it does not approach the causal rigor of resource



consumption accounting's (RCA) attributable cost concept, particularly in light of problems with TD-ABC's view on cost behavior and the use of practical capacity as the denominator in rate calculations. The use of practical capacity costs as the denominator means that not all excess/idle capacity costs are effectively isolated.

TD-ABC AND THE PRINCIPLE OF VARIABILITY

The original view of cost behavior in traditional ABC survived wholly intact in TD-ABC. This has two sets of negative effects. First, it limits the benefits TD-ABC is able to realize from the improvements in causality. For example, excess/idle capacity costs are fixed costs only, but TD-ABC (because of its view on cost behavior) cannot identify all operationally fixed costs. TD-ABC pays lip service to isolating excess/idle capacity costs but has no mechanism to identify all those fixed costs related to idle time. TD-ABC also claims improved budgeting capabilities by using planned activity driver quantities and their causal relations to extrapolate costs into a new budget. However, no indication is provided of how fixed input quantities that should not be incremented are distinguished from proportional input quantities that should. TD-ABC examples increment all costs in a budgeting scenario with no distinction as to fixed or proportional behavior.⁴¹ Such a linear extrapolation off all inputs and their costs in budgeting scenarios (e.g., a rolling five quarter window every quarter) is obviously erroneous. What-if analysis capability claims also run afoul of the same lack of short term operational cost behavior insights.

The second set of negative effects relates to decision support where all of the weaknesses identified with traditional ABC are inherited lock, stock, and barrel. The impractical long-term cost concept, time as a causal

factor, divorcing cost behavior from causality, and the blended cost concept error are all still front and center in TD-ABC. The question to TD-ABC is the same as to traditional ABC: What does ABC information mean to the manager that must make an outsourcing decision today? True, in the larger scheme of things it is all "variable" over the long term (as the economists claim). Lord Keynes famously quipped, "In the long-run we are all dead." But this is MA and it is the 9th hour—the manager in laying the next brick in the wall needs guidance on the avoidable cost for his specific decision, right now.

TD-ABC AND THE PRINCIPLE OF WORK

In TD-ABC the principle of work, though still prominent, has been curtailed from its all-conquering role. As indicated above, activity-to-activity allocation has fallen out of favor. In fact, one can now safely claim (what not too long ago was considered heretical) that the need for resource insight takes precedence over the work principle.⁴²

Nevertheless, the work principle still holds a dominant position in TD-ABC primarily to fill the void from retaining traditional ABC's cost behavior view. No explicit claims as to activities' cost causation capabilities are made, but neither is a robust model for consumption and cost behavior proposed. This "letting things hang in mid-air" approach is clearly counterproductive. It would seem the newly found recognition for resources in TD-ABC has to be taken to its logical conclusion and the principle of work subjected to causality and cost behavior.

CONCLUSION

ABC brought crucial insights into key aspects of management information to the attention of the MA



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profession. Unfortunately, established principles were denied their rightful place in the process of formulating ABC, which led to sustainability challenges that prevented effective decision support using ABC information. The improvements in TD-ABC go some way towards restoring the principle of causality, but do nothing to balance cost behavior and the principle of work. ABC's dilemma is obvious: address inherent weaknesses by removing the work principle from its lofty perch but in the process deny its own essence. Without

activities, is one still dealing with an ABC system? It seems inevitable that ABC's perfect storm will continue in terms of TD-ABC and effective decision support.

This article concludes the discussion on contemporary MA approaches—theory of constraints, lean accounting, and activity-based costing—and their principles. The final paper in the series will demonstrate how management accounting's principles should be combined in a comprehensive modeling and decision support system.



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NOTES

- ¹ A. van der Merwe, "The Management Accounting Philosophy Series II: Cornerstone Restoration," Cost Management Sep/Oct 2007: 26-33.
- ² The terms *monetary* and *monetary information* as used in this series refers to the dollars a MA approach associates with operational input and output quantities for managers to use in decision analysis.
- ³ T. Johnson and R. Kaplan, Relevance Lost: The Rise and Fall of Management Accounting (Boston, MA: Harvard Business School Press, 1987).
- ⁴ T. Johnson, Relevance Regained: From Top-Down Control to Bottom-Up Empowerment (New York, NY: Simon & Schuster, Inc., 1990). Referencing E. Kohler, A Dictionary for Accountants, (Prentice Hall, 1952)18-19.
- ⁵ Johnson 133.
- ⁶ G. Staubus, Activity Costing and Input-Output Accounting (Homewood, IL: Richard D. Irwin, Inc., 1971).
- ⁷ Johnson 136. Arthur Andersen used the General Electric analysis in their consulting work in the 1970s and 80s.
- ⁸ C. Berliner and J. Brimson, Cost Management for Today's Advanced Manufacturing: The CAM-I Conceptual Design (Boston, MA: Harvard Business School Press, 1988) 14.
- ⁹ A. Garg et al., "Roles and Practices in Management Accounting Today: Results From the 2003 IMA-E&Y Survey," Strategic Finance Jul 2003 and CAM-I "A Marginal Analytics Survey," A Resource Consumption Accounting Interest Group Deliverable, CAM-I Blue Book, 2003.
- ¹⁰ P. Sharman, "IMA: Meet Bob Kaplan," Strategic Finance Mar 2008: 19. *"It is simpler, faster, and more powerful than the traditional ABC version introduced in the 1980s. I guess it took 20 years to understand the fundamentals of costing sufficiently well to design an approach as elegant as time-driven ABC."*
- ¹¹ In this article the terms traditional ABC and *Time-driven ABC* will be used to distinguish the initial wave of ABC adoptions from its most recent iteration. The reader should note that due to a lack of standards in ABC, practices vary (sometimes significantly). Any attempt to attribute characteristics to *traditional ABC* is likely to run into at least some variation in practice. In an attempt to address this issue, this article focused on authoritative ABC sources.
- ¹² The *work principle* is the author's own term (for the sake of brevity/convenience) for a principle claimed in ABC literature as foundational. The term *work* was gleaned from the ABC Cross (see Exhibit 2) that depicts the principle. As will be discussed, the *work principle* in ABC places activities at the center of causality and cost behavior.
- ¹³ Staubus 121.
- ¹⁴ Staubus 7.
- ¹⁵ A. van der Merwe and D. Keys, "The Case For RCA Series III: Decision Support in An Advanced Cost Management System," Journal of Cost Management Nov/Dec 2001: 35-36.
- ¹⁶ M. Clark, Studies in the Economics of Overhead Costs (Chicago, IL: The University of Chicago Press, 1923) 21-52.
- ¹⁷ R. Kaplan and R. Cooper, Cost and Effect: Using Integrated Cost Systems to Drive Profitability and Performance (Boston, MA: Harvard Business School Press, 1998) 182.
- ¹⁸ R. Kaplan and S. Anderson, Time-driven Activity-based Costing: A Simpler and More Powerful Path to Higher Profits (Boston MA: Harvard Business School Press, 2007) 86. Emphasis in the original.
- ¹⁹ Clark 21-52.
- ²⁰ Kaplan and Cooper 182.
- ²¹ Kaplan and Anderson 86. Emphasis in the original.
- ²² Johnson and Kaplan 234. *"Conventional notions of fixed and variable costs are ignored because, for the purposes of product cost analysis, the time period is long enough to warrant treatment of virtually all costs as variable."*

Notes continued on the next page.



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DEBATING THE PRINCIPLES: ABC AND ITS DOMINANT PRINCIPLE OF WORK

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- ²³ B.D. Clinton and A. van der Merwe, "Understanding Resource Consumption and Cost Behavior Part I: The Blended Cost Concept Error," Cost Management May/June 2008: 33-39. For a detailed discussion on this topic.
- ²⁴ Johnson and Kaplan 235. *"The goal of a good product cost system should be to make obvious, more transparent, how costs currently considered to be fixed or sunk actually do vary with **decisions** made about product output, product mix, and product diversity."* Emphasis added.
- ²⁵ Johnson and Kaplan 243. *"Once we accept that virtually all product costs are variable over some reasonable time period . . ."*
- ²⁶ G. Shillinglaw, "The Concept of Attributable Cost," Journal of Accounting Research 1963: 79.
- ²⁷ N. Geisler and R. Brooks, Come, Let Us Reason: An Introduction to Logical Thinking (Grand Rapids, MI: Baker Book House, 1990) 171-173. For a discussion of this fallacy.
- ²⁸ Geisler and Brooks 171. A cause is a necessary and sufficient condition for the effect to occur.
- ²⁹ Clinton and van der Merwe 33-35. *" . . . the blended cost concept error and is committed by using **operational** cost concepts (i.e. fixed and variable) exclusively in decision support analysis."*
- ³⁰ Van der Merwe and Keys 35. The *fixed cost death spiral* is that phenomenon where the elimination of an apparent unprofitable product results in previously profitable products becoming unprofitable. That is, the fixed costs of the product that was eliminated causes other products to become unprofitable. The input side of the *fixed cost death spiral* is a similar phenomenon that results in resource and process outsourcing when related fixed costs cannot be eliminated.
- ³¹ Johnson and Kaplan 229.
- ³² Berliner 7.
- ³³ J. Miller, Implementing Activity-based Management in Daily Operations (New York, NY: Wiley & Sons, Inc. 1996) 49. *"Under ABC, activity and product/service cost (and/or other cost objects) are determined based on the primary principle that activities consume resources (costs). Products and services (cost objects), in turn, consume the activities."*
- ³⁴ G. Cokins et al., "An ABC Manager's Primer," Institute of Management Accountants 1993. The ABC Cross is depicted on the copyright page.
- ³⁵ Van der Merwe, "The Management Accounting Philosophy Series II: Cornerstone Restoration," Cost Management Sep/Oct 2007: 28. *"Managers' information need is therefore of a dual nature: (1) a quantitative model of operations cause and effect relationships and (2) a corresponding value representation of those relations."*
- ³⁶ The *divisibility* of a resource refers to whether individual resources are freed up because of a decision and can be sold off or let go.
- ³⁷ Shillinglaw 75-77. On the topic of resource divisibility. Refer also to his reference to Lewis 1949.
- ³⁸ Kaplan and Cooper 313. *" . . . what makes a resource cost variable in a downward direction is not inherent in the nature of the resource; it is a function of management decisions—first, to reduce the demand for the resource, and, second, to lower the spending on the resource."* [Note: "Variable" as used here implies avoidable.]
- ³⁹ Kaplan and Anderson 45. *"Percentage allocations rarely, if ever, represent underlying causal relationships."*
- ⁴⁰ Kaplan and Anderson 74.
- ⁴¹ Kaplan and Anderson 102-104. In particular, Step 6 in the ABB process described for Sippican Corporation.
- ⁴² Van der Merwe and Keys 35-36.



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